



Redefining the Boundaries of Life Science Research

PP
SYSTEMS
ppsystems.com



Our mission is not unique.

We share it with those committed to finding solutions for a better world.

The opportunity to support the plant and soil scientific communities in the discovery of those solutions inspires us to constantly innovate...

...to continually refine the role of instrumentation as a seamless extension of the thought process of each and every student of science...

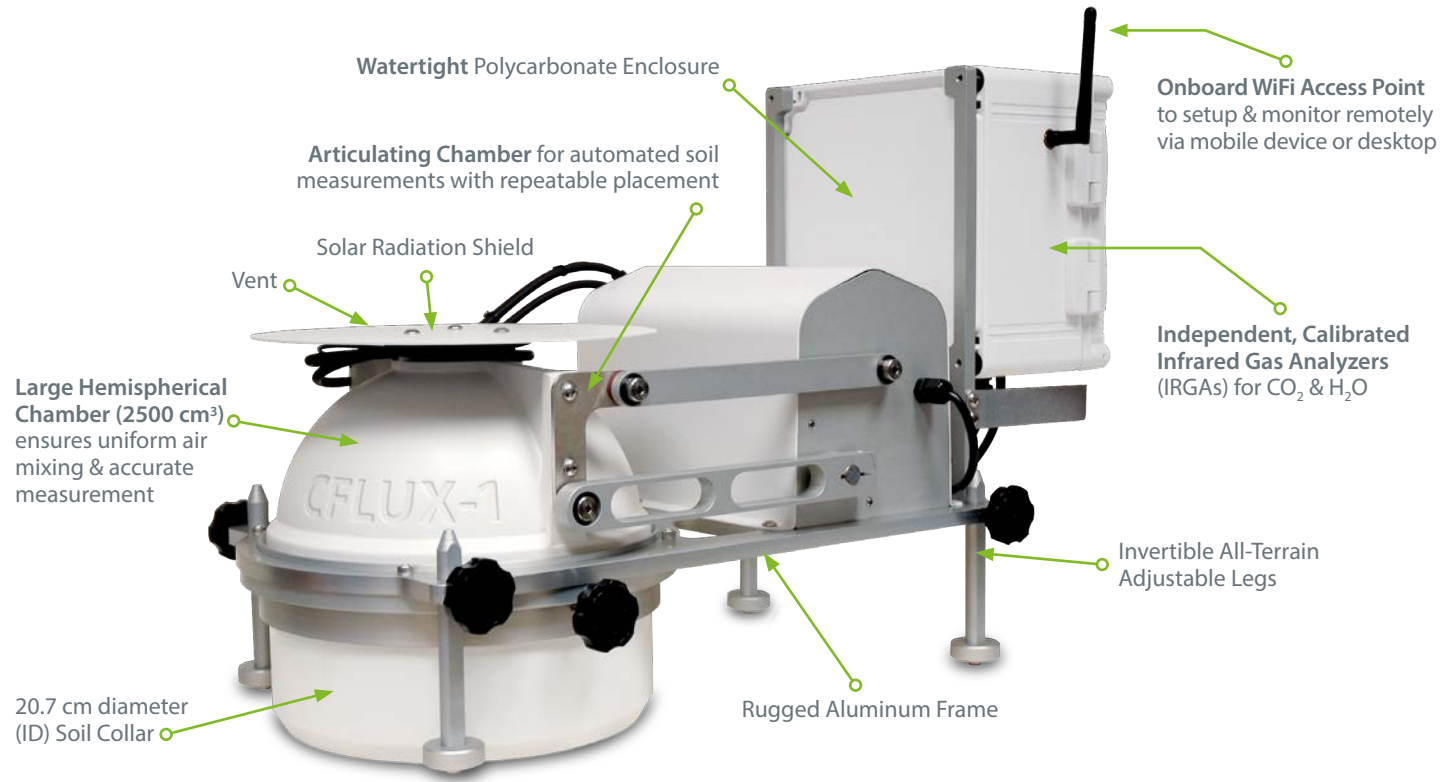
...from the students just discovering their passion to the most accomplished pioneer whose life's work has great global impact...

...providing the freedom to focus solely on the valuable work to be done.

NEW!

CFLUX-1 A dedicated, self-contained automated system for long-term, unattended measurement of soil CO₂ flux.

Ideal for both spatial & temporal analysis.



*No limit to where systems can be placed in the field.
No need for multiplexing chambers!*

- **Built-in CO₂ & H₂O Gas Analyzers**

Two independent, integral, non-dispersive infrared gas analyzers for CO₂ and H₂O in each system means:

- > Accurate measurement and fast response times regardless of location
- > No multiplexing devices are needed

- **Unique Venting System**

Pressure differences are minimized upon closure and seal

- **Expanded Measurement Range**

The CFLUX-1 can be calibrated up to 30000 ppm for measurement in high CO₂ environments

- **Soil Moisture & Soil Temperature**

Optional sensors are available

- **Easy Installation & Setup**

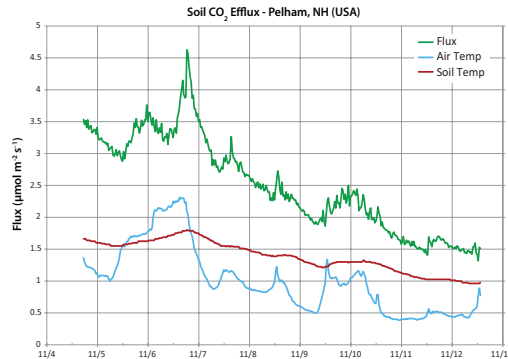
- **Fully Automatic, Programmable & Stand-alone Operation**

- **Full Data Storage**

Direct to a USB Flash Drive (memory stick) or external data logger

- **Software & Data Analysis**

- > Easily view sensor data and information via computer or mobile device
- > Flux rates based on linear and quadratic fit are continuously calculated and displayed



Measurements were recorded every 30 minutes for a period of nine consecutive days.

PP Systems
CFLUX-100013

Standby: 14 mins Start Now

Scale: 150 ppm
Δ CO₂: 78 ppm
Δ Time: 240 Sec
12:34:13

Flux-L= 1.70
Flux-Q= 1.91

Standby: 14 mins
Chamber: Open

Sample Measurements 12:34:13

CO₂ 488 <small>ppm</small>	Δ CO₂ 78 <small>ppm</small>	H₂O 10.1 <small>mb</small>
Flux-L 1.70 <small>μmol m⁻² m⁻¹</small>	Flux-Q 1.91 <small>μmol m⁻² m⁻¹</small>	Δ Time 240 <small>seconds</small>
Air Temperature 9.3 <small>°C</small>	Soil Temperature 7.5 <small>°C</small>	Soil Moisture 20.9 <small>%</small>

Standby: 14 mins
Chamber: Open

System Status 12:37:16

Standby Power High	CO₂ IRGA Temp. 55.0 <small>°C</small>	H₂O IRGA Temp. 55.1 <small>°C</small>
Air Flow 0 <small>CC / min</small>	Air Pressure 1017.7 <small>mbar</small>	Air Temperature 9.3 <small>°C</small>
Voltage 12.1 <small>Volts</small>	Status System OK	Absorber 82 <small>%</small>

Standby: 14 mins
Show More
Chamber: Open

CIRAS-3 Redefining "portability" for high-level field research. Eliminating the obstacles while elevating the research experience.

Powerful, Customizable & Intuitive
Rely on the defaults or customize your own settings to monitor and display numerical and graphical data.

Switch Display Parameters

Remote Recording

Ambient Temperature Sensor

Fast & Accurate
A true differential analyzer featuring four independent gas analyzers for CO₂ and H₂O. It's compact size and small system volume ensures the most rapid and accurate measurement of photosynthesis available.



*Meeting the demands of the serious researcher
driving the future of science.*



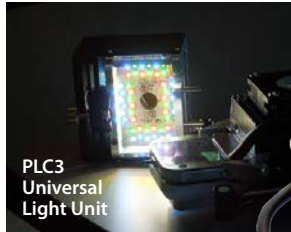
Mobile

The first truly mobile system for simultaneous measurement of photosynthesis and chlorophyll fluorescence — the ideal choice for high-level field research.

True mobility (4.5 kg)

- Less site disturbance
- Easy access to hard-to-reach areas
- No assistance or tripod needed
- Reduced fatigue

RGBW LED Light Unit



PLC3
Universal
Light Unit



RGBW LED Light Units are available for all PLC3 Leaf Cuvettes.





PLC3
Universal

For Flat,
Broad Leaves



PLC3
Narrow

For Grasses,
Long Needles
& Narrow Leaves



PLC3
Conifer

For Conifers
& Short Needle
Vegetation

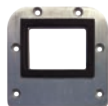
PLC3 Universal Leaf Cuvette
Interchangeable Head Plates



25 mm x 7 mm



18 mm Diameter



25 mm x 18 mm

The PLC3 Universal Leaf Cuvette comes standard with three interchangeable head plates making it the go-to cuvette in most situations.

All PLC3 Cuvettes are available with their own LED light unit for added versatility.

Versatility At Your Fingertips

The CIRAS-3 Portable Photosynthesis System is highly customizable externally as well. Expand the CIRAS-3's measurement capabilities to include:

- Chlorophyll fluorescence
- Soil CO₂ efflux
- Net canopy flux

Prefer to use your own chambers? The CIRAS-3 can act as a stand-alone CO₂ and H₂O differential gas analyzer.

Our accessories are field-changeable as well — virtually plug and play!



SRC-2 Soil Respiration Chamber



CPY-5 Canopy Assimilation Chamber

Create rapid A/C_i curves in minutes

with the CIRAS-3 & our high-speed CO_2 ramping technique.

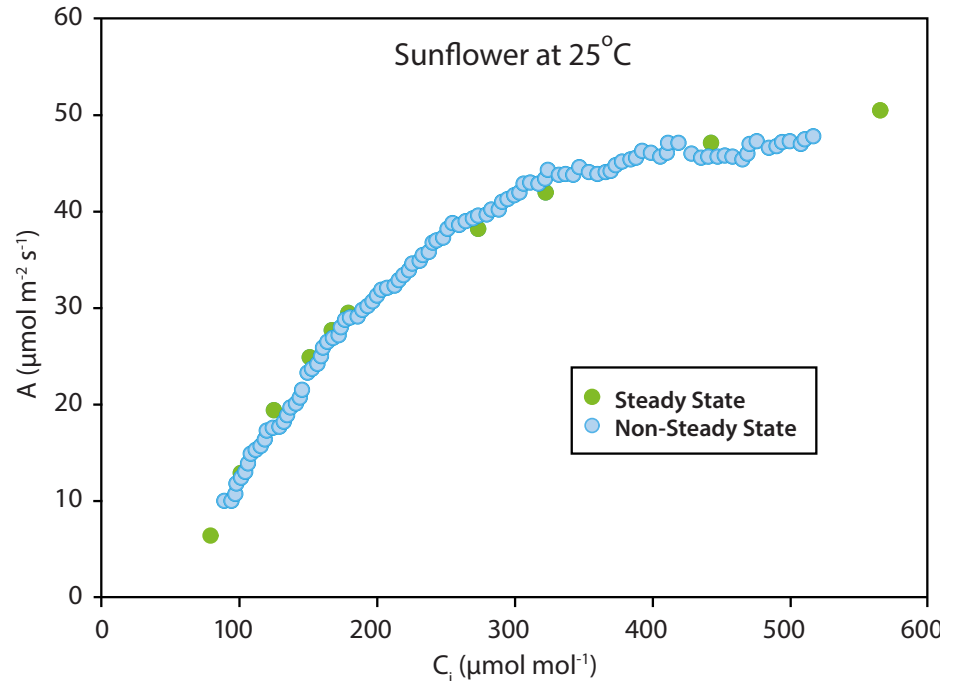
CIRAS-3 has always been capable of rapidly controlling CO_2 gas concentration while simultaneously and continuously recording data.

PP Systems' latest version of our PC-based Scripts Editor makes it simpler to create and execute response scripts for measurement of rapid A/C_i curves.

Generate ultra-fast A/C_i curves in a fraction of the time it takes to perform traditional steady-state measurements with our innovative and programmable high-speed CO_2 ramping technique.

Post Processing

In just a few simple steps in Excel, A/C_i curves can be created and analyzed.



Comparison of Non-Steady State, High-Speed CO_2 Ramping (blue points) to traditional point-by-point Steady State (green points) for a typical C_3 Sunflower.

CIRAS-3 Simultaneously measure chlorophyll fluorescence & photosynthesis.



CFM-3 Chlorophyll Fluorescence Module
Designed exclusively for our PLC3 Universal Leaf Cuvette

CIRAS-3 True mobility without sacrificing performance

- Truly mobile (4.5 kg)
- True differential analyzer
- High-speed CO₂ ramping for rapid A/C_i curves
- Simultaneously measure photosynthesis and chlorophyll fluorescence
- Automated and programmable environmental controls for CO₂, H₂O, temperature and light
- Control proportion of light by wavelength (RGBW)
- Full color 7" transfective display
- Powerful user interface and software
- Customizable programming and data presentation capabilities
- Real-time data
- Unlimited data storage

CFM-3 Chlorophyll Fluorescence Module features include:

- Built-in light source and fluorescence detection capability
- Actinic light source
- Pulse-amplitude modulated (PAM) fluorometer
- Saturating pulses up to 10000 $\mu\text{mol m}^{-2} \text{s}^{-1}$
- MultiPulse™ for estimation of F_m' apparent

Applications

- Photosynthesis
- Chlorophyll Fluorescence
- Soil Respiration
- Net Canopy CO₂ Flux
- CO₂/H₂O Gas Analysis
- Insect Respiration

TARGAS-1 The mobile photosynthesis system for teaching & basic research.



- Fully mobile and lightweight (2.1 kg)
- High-precision, non-dispersive infrared gas analyzers for both CO₂ and H₂O
- Automatic temperature and pressure compensation
- Control of CO₂, H₂O and light
- Large touch display, full sun readability
- Numerical and graphical data presentation
- Built-in air supply unit and sampling pump

Multiple accessories and sensors are available to expand the TARGAS-1's measurement capabilities. (See pg. 15 for more.)

The TARGAS-1's high technical specification and user-friendly interface make it an ideal addition to the educational environment as well as the laboratory and field.

Applications

- Photosynthesis
- Soil Respiration
- Net Canopy CO₂ Flux
- Environmental Monitoring



EGM-5 Versatility meets mobility — the perfect solution for soil CO₂ efflux & net canopy CO₂ flux.

Accurate • Reliable • Stable

For more than 30 years, our CO₂ infrared gas analyzers have been the standard for a wide variety of disciplines throughout the world.

Our innovative **Auto-Zero** measurement technique ensures the greatest accuracy, reliability and long-term stability that our customers have come to expect throughout the years.

Our powerful **GAS** software offers a user-friendly solution for monitoring, logging and recording environmental sensor data.

We offer a range of environmental probes and sensors for use with our analyzers, further enhancing their already extensive list of applications.



Soil & Canopy Flux Chambers



SRC-2 Soil
Respiration Chamber



CPY-5 Canopy
Assimilation Chamber

Our chambers are compatible with the EGM-5, CIRAS-3 & TARGAS-1

Expanding measurement capabilities.

Enhancing the process of discovery.

Rugged Transport Case
Highly field-durable & customized to hold the EGM-5 as well as the SRC-2 Soil Respiration Chamber & either the STP-2 Soil Temperature Probe or Hydra-Probe II Soil Moisture & Soil Temperature Probe



Sample Injection Kit



Environmental Sensors



Quantum Sensor (PAR)

Soil Temperature

Soil Moisture/ Soil Temperature

PAR Air Temperature

Available EGM-5 integration options:

- H₂O solid state sensor to accurately measure humidity
- O₂ electrochemical sensor for accurate O₂ measurement
- WiFi for remote, real-time monitoring

Applications

- Ambient air monitoring
- Soil CO₂ efflux
- Net canopy CO₂ flux
- Borehole CO₂ monitoring
- Global change studies
- Animal/insect respiration
- Environmental toxicology
- CO₂ sequestration
- Volcanology
- Forest & agricultural meteorology
- pCO₂ measurement



Unsurpassed accuracy & control for long-term continuous measurement of CO₂.

Fixed Installations



Available WMA-5 options:

- H₂O solid state sensor to accurately measure humidity
- O₂ electrochemical sensor for accurate O₂ measurement
- WiFi for remote, real-time monitoring

OEM Applications



Available SBA-5 options:

- H₂O solid state sensor to accurately measure humidity
- Sampling pump
- Absorber column (for Auto-Zero)
- Anodized aluminum enclosure

The ideal solution for applications demanding a highly accurate CO₂ sensor.

Applications

- Open top chambers
- Greenhouses & nurseries
- Plant growth chambers
- Environmental control rooms
- Incubators
- Fruit storage
- FACE sites
- Breweries
- Ambient air monitoring
- CO₂ leakage monitoring
- Indoor air quality & safety
- Industrial monitoring

CO₂ Gas Analyzer features by instrument

	EGM-5	WMA-5	SBA-5
High precision, non-dispersive infrared gas analyzer for CO ₂	●	●	●
Accuracy: <1 % of span over calibrated range	●	●	●
CO ₂ ranges up to 100000 ppm (10%)	●	●	●
Automatic pressure & temperature compensation	●	●	●
Powerful GAS software	●	●	●
Numeric & graphical data display	●	●	
Data storage	USB	USB	
Power requirements	AC/DC	AC/DC	6-18 VDC
Data outputs	V/D	V/C/D	V/C/D
High-contrast touch display	●	●	
Built-in sampling pump & electronic flow sensor	●	●	Optional
External water trap		●	
Visual & audible warning (high/low CO ₂)	●	●	

V=Voltage C=Current (4 - 20 mA) D=Digital



The global standard for CO₂ & H₂O gas analysis
for research that commands accuracy, reliability & stability.

CIRAS-3 SC

Single Channel (Absolute)



The CIRAS-3 SC has two independent, non-dispersive infrared gas analyzers for CO₂ and H₂O for measurement from a single gas stream.

CIRAS-3 DC

Dual Channel (Differential)



The CIRAS-3 DC has four independent, non-dispersive infrared gas analyzers for CO₂ and H₂O for measurement from two gas streams.

Common features

- Built-in Auto-Zero
- Fully compensates for changes in temperature, pressure and foreign gas broadening
- Unlimited data storage
- Built-in sampling pump with mass flow controller
- Powerful, intuitive user interface and software
- Remote display capability
- Internal 7.2V Li-Ion rechargeable battery (optional) for portability

Applications

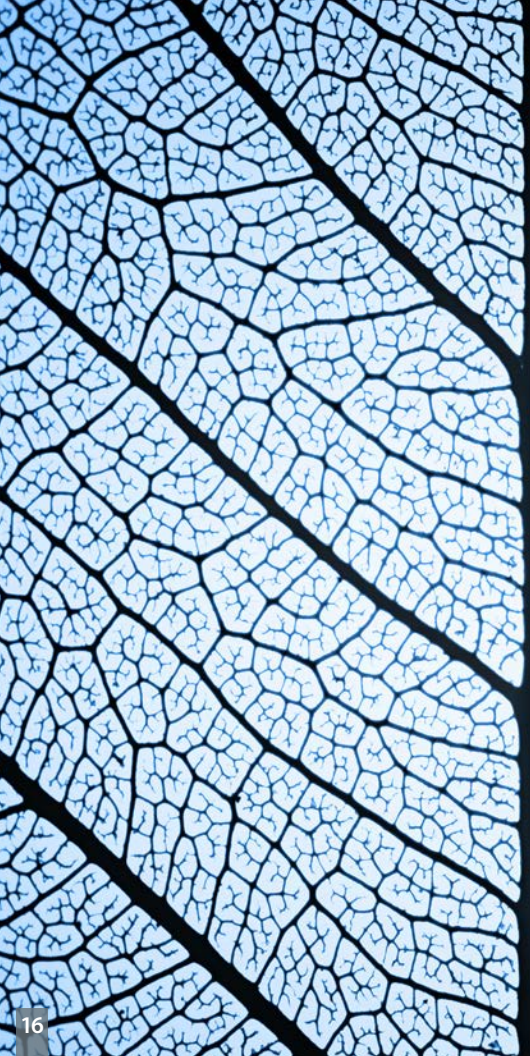
- Plant physiology
- Soil CO₂ efflux
- Net canopy CO₂ flux
- Forest & agriculture meteorology
- pCO₂ measurement
- Atmospheric studies

Accessory Compatibility by *instrument*

<i>Chambers & Sensors</i>	CIRAS-3*	TARGAS-1	EGM-5	WMA-5	SBA-5
SRC-2 Soil Respiration Chamber	●	●	●		
CPY-5 Canopy Assimilation Chamber	●	●	●		
Insect Respiration Chamber	●				
STP-2 Soil Temperature Probe		●	●		
Quantum Sensor (PAR)		●	●		
TRP-3 Temperature/PAR Probe		●	●		
HydraProbe II (Soil Moisture & Soil Temperature)		●	●		
<i>Integrated Options</i>					
H ₂ O Solid State Sensor			●	●	●
O ₂ Electrochemical Sensor			●	●	
WiFi			●	●	
<i>Kits</i>					
Sample Injection Kit		●	●		●

* Refers to the CIRAS-3 Portable Photosynthesis System





Your research partner since 1984

PP Systems has proudly designed and manufactured instrumentation to meet the technology needs of plant and soil scientists since 1984. Our extensive experience working closely with scientists to provide the best possible research tools, along with our drive to constantly enhance the research and educational experience, has afforded us the honor of being one of the most highly referenced global standards in more than 100 countries worldwide.

Accurate, Reliable & Revolutionary

Our instruments have long been trusted for their accuracy, reliability and stability.

PP Systems is recognized as a world leader and proven innovator in the design and manufacture of rugged photosynthesis, soil respiration, chlorophyll fluorescence and CO₂/H₂O gas analysis instrumentation for high-level research.

Trusted & Tested Technology

Training

Training is offered free of charge for all customers. Classes are provided throughout the year and can be arranged to fit within your schedule.

Classes are intentionally kept small to afford personalized attention and to ensure that everyone receives the maximum benefit of attending the course. The course is designed for the first time user as well as those who need a refresher course on operation and general maintenance.

Contact PP Systems to learn more about training options or to schedule a training class.

Your Research Partner

We want you to have the best possible experience as well as to fully utilize the instruments you purchase from us.

Customers receive direct technical support from our U.S. headquarters as well as through our extensive network of factory trained distributors.

If you would like to learn more about us, visit our website at ppsystems.com where you will find more detailed specifications about each product including data sheets as well as application notes that show how our amazing customers are using our instruments.

You are welcome to call to discuss your research needs with a member of our technical staff @ +1 978.834.0505.





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